L Number	Hits		DB	Time stamp
1	151	(light adj absorbing) with (via or trench)	USPAT;	2003/02/20 13:06
			US-PGPUB	
2	32	((light adj absorbing) with (via or	USPAT;	2003/02/20 13:06
		trench)) and dielectric	US-PGPUB	
3	83	(light adj absorbing) with (via or trench)	EPO; JPO;	2003/02/20 13:06
			DERWENT;	
	;		IBM TDB	
4	5	((light adj absorbing) with (via or	EPO; JPO;	2003/02/20 13:06
		trench)) and dielectric	DERWENT;	•
			IBM TDB	1

DERWENT-ACC-NO: 2000-685874

DERWENT-WEEK: 200067

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TITLE: Optical inspection of semiconductor devices by

depositing a light

absorbing layer in the shallow trench isolation of silicon
on insulator wafer

INVENTOR: LASKY, J B; PHILIPS, B; SPERANZA, A C; WONG, J; YU, M H

PATENT-ASSIGNEE: INT BUSINESS MACHINES CORP[IBMC]

PRIORITY-DATA: 1999US-0224826 (January 4, 1999)

PATENT-FAMILY:

PUB-NO PUB-DATE LANGUAGE

PAGES MAIN-IPC

US 6121064 A September 19, 2000 N/A

008 H01L 021/66

APPLICATION-DATA:

PUB-NO APPL-DESCRIPTOR APPL-NO

APPL-DATE

US 6121064A N/A 1999US-0224826

January 4, 1999

INT-CL (IPC): H01L021/66

ABSTRACTED-PUB-NO: US 6121064A

BASIC-ABSTRACT: NOVELTY - Semiconductor devices are

optically inspected by

depositing a light absorbing layer (20) in the shallow

trench isolation (STI)

of a silicon on insulator (SOI) wafer so that silicon

inclusions (4) in the

buried insulator layer (2) created during processing of the

silicon wafer (3)

are blocked during optical inspection of the resulting wafer.

DETAILED DESCRIPTION - Optical inspection of semiconductor devices comprises

providing a material that is capable of masking defects over a semiconductor substrate, and a layer of material to be inspected disposed over this material. Light is emitted through these layers to reflect a portion of any defects of the material layer while attenuating another portion of light the material layer. Any defect in the layer of material is then detected. INDEPENDENT CLAIMS are also included for (A) a method of fabricating and optically inspecting a semiconductor device having an STI comprising depositing a pad dielectric layer to a silicon layer (1) of an SOI substrate, patterning and etching a trench (25) for an STI in the pad dielectric layer and the silicon layer, exposing the first insulative layer (12) within the SOI substrate, growing a thermal oxide film on the walls of the trench, depositing a light absorbing film on the trench, which is then filled with a second insulative material, and inspecting the semiconductor device by (a) emitting light having a wavelength which is absorbed by the silicon layer on the SOI substrate and the light absorbing film, and (b) detecting any defects introduced into the STI and subsequently processing of the semiconductor device due to the reflection of the defects; and (B) an optically inspectable semiconductor device having the STI comprising an SOI substrate having a first insulative layer and a single crystal layer of silicon, a pad dielectric layer disposed over the silicon layer, an STI etched in the pad dielectric layer and silicon layer, a thermal oxide film grown into the trench, a light absorbing film deposited on the trench, and a second insulative layer to fill the trench.

USE - For optically inspecting semiconductor devices.

ADVANTAGE - The method reduces the background defects so that optical

inspection of the SOI wafer is improved without having to discriminate against

the defects created by the STI formation and the inclusions created during

processing. It distinguishes defects created by processing against defects

created in prior level processing so that continual processing may be avoided

prior to correction or removal of defective wafers in the production line.

in cross section of an inspectable SOI wafer having shallow trench isolation.

Silicon layer 1

Buried insulator layer 2

Silicon wafer 3

Silicon inclusions 4

Insulative layer 12

Light absorbing film 20

Trench 25

CHOSEN-DRAWING: Dwg.3/4

TITLE-TERMS:

OPTICAL INSPECT SEMICONDUCTOR DEVICE DEPOSIT LIGHT ABSORB LAYER SHALLOW TRENCH ISOLATE SILICON INSULATE WAFER

DERWENT-CLASS: LO3 SO1 SO2 SO3 U11

CPI-CODES: L04-C12C; L04-C18;

EPI-CODES: S01-G02B1; S02-A03B1; S03-E04F2; U11-C05B5;

U11-C05B9C; U11-C08A3;

U11-C08A6; U11-F01A3; U11-F01B4;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: C2000-208550

Non-CPI Secondary Accession Numbers: N2000-507001

DERWENT-ACC-NO: 1996-039498

DERWENT-WEEK: 199604

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TITLE: Binary optical photolithography mask for projecting

image onto target

in semiconductor mfr. - having absorber pattern buried

below surface of quartz

substrate to provide for max. depth of focus of exposure

system without imaging

surface defects and contaminants

INVENTOR: VASUDEV, P K

PATENT-ASSIGNEE: SEMATECH INC[SEMAN]

PRIORITY-DATA: 1994US-0342940 (November 21, 1994)

PATENT-FAMILY:

PUB-NO PUB-DATE LANGUAGE

PAGES MAIN-IPC

US 5474865 A December 12, 1995 N/A

013 G03F 009/00

APPLICATION-DATA:

PUB-NO APPL-DESCRIPTOR APPL-NO

APPL-DATE

US 5474865A N/A 1994US-0342940

November 21, 1994

INT-CL (IPC): G03F009/00

ABSTRACTED-PUB-NO: US 5474865A

BASIC-ABSTRACT: Binary optical photolithography mask (30)

for projecting image

pattern onto a target has substrate (31) formed from

transparent material

transmitting light in which an absorber pattern (32) formed

from light

absorbing material is buried a set distance, d, below the

surface near the

target, but not at the surface, for absorbing at least a

significant portion of

transmitted light to form an opaque image pattern on the

02/20/2003, EAST Version: 1.03.0002

target. The absorber

pattern reflects light scattered from its surface areas back into the substrate

at their surface interface and improves image feature definition at the target.

The distance, d, at which the absorber pattern is buried below the surface is

sufficient to provide for maximum depth of focus of an exposure system within

the substrate such that surface defects and contaminants at the surface

interface are not imaged onto the target. Also claimed is a method of

fabricating the binary optical photolithography mask by forming a

photoresistive layer over the substrate, patterning the layer to expose

portions of the underlying substrate, etching those exposed portions to a

predefined depth to form **trenches** in the substrate, removing the remainder of

the photoresistive layer, depositing a layer of <u>light</u> absorbing material over

the substrate to fill the **trenches**, selectively etching back the layer until

only the **trenches** are filled with the **light absorbing** material, and forming a

dielectric layer of predefined thickness over the substrate
and trenches to

form an upper boundary region of the mask having the $\underline{\textbf{light}}$ $\underline{\textbf{absorbing}}$ material

buried below its surface.

USE - Mask is used for mfr. semiconductor devices.

ADVANTAGE - The buried absorbers in the mask significantly reduce edge

diffraction effects and eliminate any need for a pellicle.

CHOSEN-DRAWING: Dwg.5/16

TITLE-TERMS:

BINARY OPTICAL PHOTOLITHOGRAPHIC MASK PROJECT IMAGE TARGET SEMICONDUCTOR

MANUFACTURE ABSORB PATTERN BURY BELOW SURFACE QUARTZ SUBSTRATE MAXIMUM DEPTH

FOCUS EXPOSE SYSTEM IMAGE SURFACE DEFECT CONTAMINATE

DERWENT-CLASS: LO3 P84 U11

CPI-CODES: L04-C06A;

EPI-CODES: U11-C04D; U11-C04E2;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: C1996-013231 Non-CPI Secondary Accession Numbers: N1996-033328